

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A piezoelectric actuator for an ink jet printhead, comprising:

- a block body of piezoelectric material having a bottom face through which the mechanical energy of the actuator is transferred to a receiving member, said body having an active portion adjacent to the bottom face as well as an inactive portion disposed between said active portion and a top face of said block body;wherein the active portion is divided into a plurality of fingers arranged in parallel to one another and integrally connected with each other by the inactive portion of the block body,

- a layered structure of alternating signal electrodes and common electrodes arranged in the active portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material,~~wherein each signal electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one signal electrode;~~

- a layered structure of alternating auxiliary electrodes and common electrodes arranged in the inactive portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material,~~wherein each auxiliary electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one auxiliary electrode;~~

- at least one signal lead electrode formed on a first side face of said

block body of piezoelectric material and interconnecting the signal electrodes;
wherein a separate signal lead electrode is formed on each finger of the active portion and is extended over the inactive portion of the block body;

- a ground lead electrode formed on a second side face opposite to the first side face and interconnecting the common electrodes;

- and an auxiliary lead electrode interconnecting the auxiliary electrodes, wherein the auxiliary lead electrode is formed on a third side face of the block body, ~~wherein the active portion is divided into a plurality of fingers arranged in parallel to one another and integrally connected with each other by the said inactive portion of the block body.~~

CLAIM 2 (CANCELLED)

3. A piezoelectric actuator according to claim 1, wherein contact electrodes connected to each of the signal lead electrodes and a contact electrode electrically connected to the ground lead electrode are formed on a top face of the block body opposite to said bottom face.

4. A piezoelectric actuator according to claim 3, wherein at least one additional contact electrode is formed on an edge portion of the top face of the block body and is electrically connected to the auxiliary lead electrode.

5. The piezoelectric actuator according to claim 4, wherein the contact electrodes are formed on both the top face and the bottom face of the block body.

CLAIM 6 (CANCELLED)

7. (Previously Amended) The piezoelectric actuator according to claim 11, wherein the auxiliary electrodes extend over both inactive portions of the block body, and dummy electrodes are provided in the second active portion, each dummy electrode being arranged in the same plane as a corresponding one of the common electrodes and being electrically connected to the auxiliary lead electrode.

CLAIM 8 (CANCELLED)

9. (Previously Amended) The ink jet printhead according to claim 12, wherein a connecting piece electrically connects the signal electrodes and common electrodes of the actuator and is disposed on a top face of the block body opposite to the bottom face thereof.

10. The ink jet printhead according to claim 9, wherein the length of the actuator in the longitudinal direction of the ink channels is equal to or smaller than the length of the

ink channels.

11. (Currently Amended) A piezoelectric actuator for an ink jet printhead, comprising:

a block body of piezoelectric material having a bottom face through which the mechanical energy of the actuator is transferred to a receiving member, said body having an active portion adjacent to the bottom face as well as a first inactive portion disposed between said active portion and a top face of said block body, wherein the active portion is divided into a plurality of fingers arranged in parallel to one another and integrally connected with each other by the inactive portion of the block body, ~~and a second inactive portion adjacent to a portion of the bottom face;~~

a layered structure of alternating signal electrodes and common electrodes arranged in the active portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, ~~wherein each signal electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one signal electrode;~~

a layered structure of alternating auxiliary electrodes and common electrodes arranged in the first inactive portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, ~~wherein each auxiliary electrode is neighbored by at least one common electrode and each~~

~~common electrode is neighbored by at least one auxiliary electrode;~~

at least one signal lead electrode formed on a first side face of said block body of piezoelectric material and interconnecting the signal electrodes;
wherein a separate signal lead electrode is formed on each finger of the active portion and is extended over the inactive portion of the block body;

a ground lead electrode formed on a second side face opposite to the first side face and interconnecting the common electrodes;

and an auxiliary lead electrode interconnecting the auxiliary electrodes, wherein the auxiliary lead electrode is formed on a third side face of the block body, and wherein the block body comprises a second inactive part adjacent to a portion of the bottom face.

12. (Currently Amended) An ink jet printhead containing a piezoelectric actuator, said piezoelectric actuator comprising:

a block body of piezoelectric material having a bottom face through which the mechanical energy of the actuator is transferred to a receiving member, said body having an active portion adjacent to the bottom face as well as an inactive portion disposed between said active portion and a top face of said block body; wherein the active portion is divided into a plurality of fingers arranged in parallel to one another and integrally connected with each other by the inactive portion of the block body;

a layered structure of alternating signal electrodes and common electrodes arranged in the active portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, ~~wherein each signal electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one signal electrode;~~

a layered structure of alternating auxiliary electrodes and common electrodes arranged in the inactive portion, substantially parallel with the bottom face and separated by layers of the piezoelectric material, ~~wherein each auxiliary electrode is neighbored by at least one common electrode and each common electrode is neighbored by at least one auxiliary electrode;~~

at least one signal lead electrode formed on a first side face of said block body of piezoelectric material and interconnecting the signal electrodes; wherein a separate signal lead electrode is formed on each finger of the active portion and is extended over the inactive portion of the block body;

a ground lead electrode formed on a second side face opposite to the first side face and interconnecting the common electrodes;

and an auxiliary lead electrode interconnecting the auxiliary electrodes, wherein the auxiliary lead electrode is formed on a third side face of the block body, and wherein at least one ink channel terminates in a nozzle and is covered by a flexible receiving member, said piezoelectric actuator being bonded to said flexible receiving member.

REMARKS

Claims 1, 3, 11 and 12 have been rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Japan (100) in view of the “prior art” and combined with Naka. Also, claims 4, 5, 7, 9 and 10 have been rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over Japan (100) in view of “prior art” combined with Naka as applied to claim 1, and further in view of Vehara, Dibbern, or Okumura. These rejections are respectfully traversed.

As the Examiner will note, claims 1, 11 and 12 have been amended to further distinguish the present invention from the prior art relied upon by the Examiner.

In rejecting the claims, the Examiner argues that Japan (100) teaches a piezo actuator with several inactive portions that is comparable with the inactive portion 38 of the present application. However, the only inactive portion taught by the Japan reference is positioned differently. Secondly, the other inactive portions according to the Examiner’s interpretation do not comprise dummy electrodes. In the Japanese reference, the only inactive portion visible is the portion which contains dummy electrode 6 (see Figure 5). The inactive barrier disclosed by the Japanese reference and containing the dummy electrode 6 is flushed with the active part containing the signal electrodes 5 (see Figure 5). It is therefore apparent that the Japanese reference

fails to disclose an inactive portion disposed between an active portion and the top face of the block body.

It is unclear what the Examiner intends by the expression "inactive areas are e.g., the extreme left and right ends and another near the center". Even if the Examiner interprets other parts of the actuator of the Japanese reference as being inactive portions, they are still not comparable with the inactive portion as defined in claim 1 of the present application, wherein it is clearly stated that a layered structure of alternating auxiliary electrodes and common electrodes is arranged in the inactive portion. Furthermore, it would not have been obvious for a person skilled in the art to position in the actuator of the Japanese reference, an inactive portion between the active portion and the top face of the block body, since the function of the dummy electrodes is to compensate for the deformation of the actuator active part during polarization. As can be seen in Figure 5 of the Japanese reference, the dummy electrodes are in the same plane as the signal electrodes and have the same pitch as the signal electrodes in order to obtain the desired effect. It would be obvious to one skilled in the art that an inactive portion with dummy electrodes would be placed between the active part and the top of the piezoelectric block.

Claim 1, as amended, recites that each finger is formed with a separate signal lead electrode which is extended over the inactive portion of the block body. This is clearly shown in Figures 1 and 3, wherein the separate signal

electrodes extend over the inactive portion 38 in the form of contact lead electrodes 50. This feature has also been described on page 6, lines 11-14 of the present application. In an actuator such as that shown in Figure 4 of the present application, it would not be possible to extend the signal lead electrodes 42 over the inactive portion 38 of the body 24, because the corresponding face of the inactive portion is occupied by electrodes 46 which are needed for contacting the auxiliary electrodes 40. The Japanese reference also fails to disclose fingers arranged in parallel to one another and integrally connected with each other by the inactive portion of the block body. It is clearly visible in Figure 5 of the Japanese reference, that the inactive part containing the dummy electrodes 6 is diced to form individual fingers. Even if the inactive part of the Japanese reference were used to integrally connect the fingers with each other, it would not be possible to arrive at a structure where the extended part of the signal lead electrodes 50 would be formed on the inactive portion disclosed between the active portion and the top face of the block body and containing a layered structure of alternating auxiliary electrodes and common electrodes. Thus, no inactive portion of the Japanese reference or the Naka reference is disclosed with the same features as the inactive portion 38 of the present application.

Since claims 1, 11 and 12 are considered patentably distinguishable over the references relied upon by the Examiner, either or alone or in combination,

for the same reasons it is also believed that claims 3-5, 7, 9 and 10, which are dependent from the independent claims, are also considered allowable.

Accordingly, in view of the above amendments and remarks, reconsideration of the rejections and allowance of the claims of the present application are respectfully requested.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Mr. Joseph A. Kolasch (Reg. No. 22,463) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

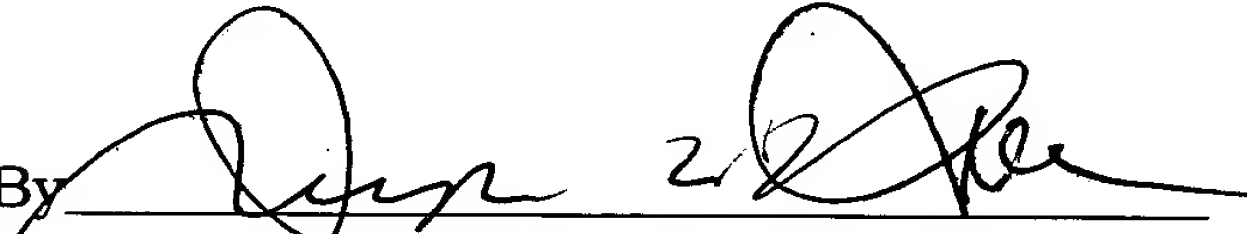
Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), the Applicant respectfully petitions for a one (1) month extension of time for filing a response in connection with the present application and the required fee of \$110.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or

1.17; particularly, extension of time fees.

Respectfully submitted,

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